UTILITY PATENT APPLICATION TRANSMITTAL

(only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	862.C2001
First Named Inventor or Application Identifier	
YASUHIRO KOMORI, ET AL.	
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] Fee Transmittal Form *(Submit an original, and a duplicate for fee processing)*
2. [X] Specification — *Total Pages* 41
3. [X] Drawing(s) *(35 USC 113)* — *Total Sheets* 2
4. [X] Oath or Declaration — *Total Pages* 2
   - a. [X] Newly executed (original or copy)
   - b. [ ] Unexecuted for information purposes
   - c. [ ] Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 17 completed)* ***[Note Box 5 below]***
     - i. [ ] DELETION OF INVENTOR(S) Signed Statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
5. [ ] Incorporation By Reference *(useable if Box 4c is checked)* The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4c, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. [ ] Microfiche Computer Program *(Appendix)*
7. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   - a. [ ] Computer Readable Copy
   - b. [ ] Paper Copy (identical to computer copy)
   - c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. [X] Assignment Papers (cover sheet & document(s))
9. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
10. [ ] English Translation Document *(if applicable)*
11. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
12. [ ] Preliminary Amendment
13. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
14. [ ] Small Entity Statement(s) [ ] Statement filed in prior application Status still proper and desired
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Other: _____

17. If a CONTINUING APPLICATION, *check appropriate box and supply the requisite information:*
    [ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No. _____

18. CORRESPONDENCE ADDRESS

[X] Customer Number or Bar Code Label — 05514 (Insert Customer No. or Attach bar code label here) — or [ ] Correspondence address below

NAME					
Address					
City		State		Zip Code	
Country		Telephone		Fax	

CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
	TOTAL CLAIMS (37 CFR 1.16(c))	38-20 =	18	X $ 18.00 =	$ 324.00
	INDEPENDENT CLAIMS (37 cfr 1.16(b))	23-3 =	20	X $ 78.00 =	$ 1560.00
	MULTIPLE DEPENDENT CLAIMS (if applicable) (37 CFR 1.16(d))			$ 260 00 =	$ 0.00
				BASIC FEE (37 CFR 1.16(a))	$ 690.00
			Total of above Calculations =		$ 2574.00
	Reduction by 50% for filing by small entity (Note 37 CFR 1.9, 1.27, 1.28).				
				TOTAL =	$ 2574.00

19. Small entity status

a. ☐ A Small entity statement is enclosed

b. ☐ A small entity statement was filed in the prior nonprovisional application and such status is still proper and desired.

c. ☐ Is no longer claimed.

20. ☒ A check in the amount of $ 2574.00 to cover the filing fee is enclosed.

21. ☒ A check in the amount of $ 40.00 to cover the recordal fee is enclosed.

22. The Commissioner is hereby authorized to credit overpayments or charge the following fees to Deposit Account No. 06-1205:

a. ☒ Fees required under 37 CFR 1.16.

b. ☐ Fees required under 37 CFR 1.17.

c. ☐ Fees required under 37 CFR 1.18.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED	
NAME	Gary M. Jacobs - Reg. No. 28,861
SIGNATURE	
DATE	September 13, 2000

GMJ\cmv

TITLE OF THE INVENTION

SPEECH INPUT TERMINAL, SPEECH RECOGNITION APPARATUS, SPEECH COMMUNICATION SYSTEM, AND SPEECH COMMUNICATION METHOD

FIELD OF THE INVENTION

The present invention relates to a speech input terminal, speech recognition apparatus, speech communication system, and speech communication method, which are used to transmit speech data through a communication network and execute speech recognition.

BACKGROUND OF THE INVENTION

A speech communication system is proposed, in which speech data is sent from a speech input terminal such as a portable telephone to a host server through a communication network, and processing for retrieval of specific information and the like are executed. In such a speech communication system, since data can be transmitted/received by speech, operation can be facilitated.

However, speech data fluctuate depending on the characteristics of a speech input terminal such as a portable telephone itself, the surrounding environment, and the like, and hence satisfactory speech recognition may not be performed.

In addition, since communication is performed under the same communication conditions under any circumstances, high communication efficiency cannot always be ensured.

SUMMARY OF THE INVENTION

The present invention has been made in consideration of the situation associated with a speech input terminal, and has as its object to provide a speech input terminal, speech recognition apparatus, speech communication system, and speech communication method which can implement optimal speech recognition or communication.

According to the present invention, there is provided a speech input terminal for transmitting speech data to a speech recognition apparatus through a wire or wireless communication network, comprising speech input means, means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and communication means for transmitting the information to the speech recognition apparatus.

In the present invention, the information is information unique to the speech input terminal or information about the surrounding environment or operation state associated with the speaker himself/herself. For example, the information includes the characteristics of the speech input terminal itself, e.g., the characteristics of

a microphone for speech input, information about the surrounding environment in which the speech input terminal is used, or the speech features of the person using the speech input terminal. This information also includes information obtained by performing acoustic analysis processing for the original data obtained from the input means.

The speech input terminal of the present invention can further comprise means for, when a data conversion condition for communication based on the information is received from the speech recognition apparatus, converting the speech data on the basis of the conversion condition.

The speech input terminal of the present invention can further comprise means for storing the information, means for determining whether there has been a change in the information in each communication, and means for, when there has been no change in the information, notifying the speech recognition apparatus of the corresponding information.

In the speech input terminal of the present invention, the terminal further comprises means for creating a speech recognition model on the basis of the information, and the communication means can transmit the information and/or the speech recognition model to the speech recognition apparatus.

According to the present invention, there is provided a speech recognition apparatus comprising speech recognition means for executing speech recognition

processing for speech data transmitted from a speech input terminal through a wire or wireless communication network, and means for receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, wherein said speech recognition means executes speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the transmitted speech data, and means for executing speech recognition processing on the basis of the information.

The speech recognition apparatus of the present invention can further comprise means for creating a speech recognition model on the basis of the information.

According to the present invention, there is provided a speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising means for receiving information for speech recognition, which is unique to the

speech input terminal or represents an operation state thereof from the speech input terminal, means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the transmitted speech data, means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

In the speech recognition apparatus of the present invention, the data conversion condition can include a data conversion condition based on a quantization table created on the basis of the information.

The speech recognition apparatus of the present invention can further comprise means for, when the speech input terminal comprises a plurality of speech input terminals, storing the information in correspondence with each of the speech input terminals.

The speech recognition apparatus of the present invention can further comprise means for, when the speech input terminal comprises a plurality of speech input terminals, storing the speech recognition model in correspondence with each of the speech input terminals.

The speech recognition apparatus of the present invention can further comprise means for, when the speech input terminal comprises a plurality of speech input terminals, storing the data conversion condition in correspondence with each of the speech input terminals.

According to the present invention, there is provided a speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein the speech input terminal comprises speech input means, means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and communication means for transmitting the information to the speech recognition apparatus, and the speech recognition apparatus comprises means for executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless

communication network wherein the speech recognition apparatus comprises means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal, and means for executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein the speech input terminal comprises speech input means, means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and communication means for transmitting the information to the speech recognition apparatus, and the speech recognition apparatus comprises means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein the speech recognition

apparatus comprises means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal, means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech communication method of transmitting speech data from a speech input terminal to a speech recognition apparatus through a wire or wireless communication network comprising in the speech input terminal, the step of creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and the step of transmitting the information to the speech recognition apparatus.

According to the present invention, there is provided a speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising the step of receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, and the step of executing speech recognition processing on the basis of the

information.

According to the present invention, there is provided a speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising the step of creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of data transmitted from the speech input terminal, and the step of executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising the step of receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, the step of determining a data conversion condition for communication on the basis of the information, and the step of transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless

communication network comprising the step of creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of data transmitted from the speech input terminal, the step of determining a data conversion condition for communication on the basis of the information, and the step of transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising, in the speech input terminal, the step of creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and the step of transmitting the information to the speech recognition apparatus, and, in the speech recognition apparatus, the step of executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising, in the speech recognition apparatus, the step of creating information for speech

recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal, and the step of executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising, in the speech input terminal, the step of creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and the step of transmitting the information to the speech recognition apparatus, and, in the speech recognition apparatus, the step of determining a data conversion condition for communication on the basis of the information; and the step of transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising, in the speech recognition apparatus, the step of creating information for speech recognition, which is unique to the speech input terminal

or represents an operation state thereof, on the basis of speech data from the speech input terminal, the step of determining a data conversion condition for communication on the basis of the information; and the step of transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a storage medium recording a program for, in order to transmit speech data from a speech input terminal to a speech recognition apparatus through a wire or wireless communication network, causing a computer to function as means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and communication means for transmitting the information to the speech recognition apparatus.

According to the present invention, there is provided a storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as means for receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, and means for executing speech recognition processing on the basis of the information.

According to the present invention, there is provided

a storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the speech data transmitted from the speech input terminal, and means for executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as means for receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, and means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless

communication network, causing a computer to function as means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the speech data transmitted from the speech input terminal, means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

Other features and advantages of the present invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

Fig. 1 is a block diagram showing the arrangement of a speech communication system according to an embodiment of the present invention; and

Fig. 2 is a flow chart showing the processing performed by the speech communication system according to the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Preferred embodiments of the present invention will now be described in detail in accordance with the accompanying drawings.

Fig. 1 is a block diagram showing the arrangement of a speech communication system according to an embodiment of the present invention.

The speech communication system is comprised of a portable terminal 100 serving as a speech input terminal, a main body 200 serving as a speech recognition apparatus, and a communication line 300 for connecting these components to allow them to communicate with each other.

The portable terminal 100 includes an input/output unit 101 for inputting/outputting speech, a communication control unit 102 for executing communication processing with the main body 200, an acoustic processing unit 103 for performing acoustic processing for the input speech, an environment information creation unit 104 for creating information unique to the portable terminal 100 or information indicating its operation state (to be referred to as environment information hereinafter in this embodiment), and a speech communication information creation unit 105.

The main body 200 includes an environment adaptation unit 201 for performing processing based on the environment

information of the portable terminal 100, a communication control unit 202 for executing communication processing with the portable terminal 100, a speech recognition unit 203 for executing speech recognition processing for speech data from the portable terminal 100, a speech communication information creation unit 204 for setting data conversion conditions for communication, a speech recognition model holding unit 205, and an application 206.

The sequence of operation of the speech communication system having the above arrangement will be described next with reference to Fig. 2. Fig. 2 is a flow chart showing the processing performed by the speech communication system.

The processing performed by the speech communication system is constituted by an initialization mode of analyzing environment information and a speech recognition mode of communicating speech data.

In step S401, all processes are started. Information for the start of processing is sent from the input/output unit 101 to the communication control unit 202 of the main body 200 through the communication control unit 102.

In step S402, a message is selectively sent from the speech recognition unit 203 or application 206 to the portable terminal 100. When, for example, supervised speaker adaptation based on environment information is to be performed, a list of contents to be read aloud by a user

is sent and output as a message (speech or characters) from the input/output unit 101 of the portable terminal 100. When microphone adaptation based on environment information is to be performed, information for prompting the utterance of speech for a few seconds may be output as a message from the input/output unit 101 of the portable terminal 100. On the other hand, when noise adaptation based on environment information is to be performed, step S402 may be skipped.

In step S403, speech data (containing noise) is entered from the input/output unit 101 to create environment information in the portable terminal portable terminal 100.

In step S404, the acoustic processing unit 103 acoustically analyzes the entered speech data. If the environment information is to be converted into a model (average, variance, or phonemic model), the information is sent to the environment information creation unit 104. Otherwise, the acoustic analysis result is sent from the communication control unit 102 to the main body. Note that the speech data may be directly sent without performing any acoustic analysis to the main body to be subjected to analysis and the like on the main body 200 side.

When the environment information is converted into a model in step S404, the flow advances to step S405 to cause the environment information creation unit 104 to create

environment information. For the purpose of noise adaptation, for example, environment information is created by detecting a non-speech interval and obtaining the average and variance of parameters in the interval. For the purpose of microphone adaptation, environment information is created by obtaining the average and variance of parameters in a speech interval. For the purpose of speaker adaptation, a phonemic model or the like is created.

In step S406, the created environment information model, acoustic analysis result, or speech is sent from the communication control unit 102 to the main body 200.

In step S407, the main body 200 receives sent the environment information through the communication control unit 202.

In step S408, the environment adaptation unit 201 performs environment adaptation with respect to a speech recognition model in the speech recognition model holding unit 205 on the basis of the environment information to update the speech recognition model into an environment adaptation speech recognition model. This model is then held by the speech recognition model holding unit 205.

As a method for environment adaptation, for example, a PMC technique can be used, which creates an environment adaptation speech recognition model from a noise model and speech recognition model. In the case of microphone

adaptation, for example, a CMS technique can be used, which creates an environment adaptive speech recognition model by using the average of speech for adaptation and a speech recognition model.

In the case of speaker adaptation, for example, a method of creating a speaker adaptation model by using a speaker adaptation model and speech recognition model can be used. If a speech or acoustic analysis result is sent instead of an environment information model, a method of converting environment information into a model and further performing adaptation on the main body 200 side can be used. Alternatively, a method of performing environment adaptation by directly using a speech or acoustic analysis result, EM learning technique, VFS speaker adaptation technique, or the like can be used as an environment adaptation method. Creating an environment adaptive speech recognition model can improve recognition performance.

Obviously, a speech recognition model may be created on the portable terminal 100 side and sent to the main body 200 to be used.

In step S409, in order to improve the communication efficiency of speech recognition, the speech communication information creation unit 204 performs environment adaptation for a table for the creation of communication speech information. A method of creating a scalar

quantization table of parameters of the respective dimensions which are used for speech recognition by using the distribution of environment adaptive speech recognition models will be described below. As this method, various methods can be used. The simplest method is a method of searching 3σ of the respective dimensions for the maximum and minimum values, and dividing the interval therebetween into equal portions.

The number of quantization points may be decreased by a method of merging all distributions into one distribution, searching 3σ (e.g., a range in which most of samples appearing in a Gauss distribution are included) for the maximum and minimum values, and dividing the interval therebetween into equal portions.

As a more precise method, for example, a method of assigning quantization points in accordance with the bias of all distributions may be used. In this method, since a scalar quantization table of the respective dimensions is created by using the distribution of environment adaptive speech recognition models, the bit rate for communication can be decreased without degrading the recognition performance, thus allowing efficient communication.

In step S410, the created scalar quantization table is transmitted to the portable terminal 100.

In step 411, the created scalar quantization table

is received by the portable terminal 100 and stored in the speech communication information creation unit 105.

With the above operation, the initialization mode is terminated. If a plurality of portable terminals 100 are present, the main body 200 can store data such as environment information, speech recognition models, and quantization tables in units of portable terminals.

The flow then shifts to the speech recognition mode.

In step S412, speech is input through the input/output unit 101.

In step S413, the input speech data is acoustically analyzed by the acoustic processing unit 103, and the resultant data is sent to the speech communication information creation unit 105.

In step S414, the speech communication information creation unit 105 performs scalar quantization of the acoustic analysis result on the speech data by using a scalar quantization table, and encodes the data as speech communication information. The encoded speech data is transmitted to the main body 200 through the communication control unit 102.

In step S415, the main body 200 causes the speech recognition unit 203 to decode the received speech data, execute speech recognition processing, and output the recognition result. Obviously, in this speech recognition processing, the previously created speech recognition

model is used.

In step S416, the speech recognition result is interpreted by the application 206 to obtain an application corresponding to the result, and the application result is sent to the communication control unit 202.

In step S417, the application result is sent to the portable terminal 100 through the communication control unit 202 of the main body 200.

In step S418, the portable terminal 100 receives the application result through the communication control unit 102.

In step S419, the portable terminal 100 outputs the application result from the input/output unit 101. When speech recognition is to be continued, the flow returns to step S412.

In step S420, the communication is terminated.

As described above, in the speech communication system of this embodiment, since speech recognition is performed by using a speech recognition model that adapts to the environment information of the portable terminal 100, optimal speech recognition can be executed in correspondence with each portable terminal. In addition, since communication conditions are set on the basis of environment information, communication efficiency can be improved in correspondence with each portable terminal.

In this embodiment, in the case of noise, the average

and variance of parameters in a noise interval are obtained and sent to the main body to perform noise adaptation of a speech recognition model by the PMC technique. Obviously, however, another noise adaptation method can be used. In addition, according to the method described above, an average and variance are obtained on the terminal side and transmitted. However, speech information may be sent to the main body side to obtain an average and variance so as to perform noise adaptation.

With regards to microphone characteristics, this embodiment has exemplified the method of obtaining the average and variance of parameters in a speech interval of a certain duration, sending them to the main body, and performing microphone characteristic adaptation of a speech recognition model by the CMS technique. Obviously, however, another microphone characteristic adaptation method can be used. In addition, according to the method described above, an average and variance are obtained on the terminal side and transmitted. However, speech information may be sent to the main body side to obtain an average and variance so as to perform noise adaptation.

This embodiment has exemplified the speaker adaptation method of creating a simple phonemic model representing user's speech features in advance, sending it to the main body, and performing speaker adaptation of a speech recognition model. However, speech information may

be sent to the main body side to perform speaker adaptation by using speech on the main body side. Obviously, in this case as well, other various speaker adaptation methods can be used.

In this embodiment, noise adaptation, microphone adaptation, and speaker adaptation are described independently. However, they can be properly combined and used.

In this embodiment, the initialization mode is to be performed before the speech recognition mode. Once the initialization mode is completed, however, speech recognition can be resumed from the speech recognition mode under the same environment. In this case, the previous environment information is stored on the portable terminal 100 side, and environment information created in resuming speech recognition is compared with the stored information. If no change is detected, the corresponding notification is sent to the main body 200, or the main body 200 performs such determination on the basis of the sent environment information, thus executing speech recognition.

In this embodiment, environment information is used for both speech recognition processing and an improvement in speech efficiency. Obviously, however, only one of these operations may be executed by using the environment information.

Although the preferred embodiment of the present

invention has been described above, the objects of the present invention are also achieved by supplying a storage medium, which records a program code of a software program that can realize the functions of the above-mentioned embodiments to the system or apparatus, and reading out and executing the program code stored in the storage medium by a computer (or a CPU or MPU) of the system or apparatus. In this case, the program code itself read out from the storage medium realizes the functions of the above-mentioned embodiments, and the storage medium which stores the program code constitutes the present invention. The functions of the above-mentioned embodiments may be realized not only by executing the readout program code by the computer but also by some or all of actual processing operations executed by an OS (operating system) running on the computer on the basis of an instruction of the program code.

Furthermore, the functions of the above-mentioned embodiments may be realized by some or all of actual processing operations executed by a CPU or the like arranged in a function extension board or a function extension unit, which is inserted in or connected to the computer, after the program code read out from the storage medium is written in a memory of the extension board or unit.

As many apparent widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the

invention is not limited to the specific embodiments thereof except as defined in the claims.

DE 3530420 A1

WHAT IS CLAIMED IS:

1. A speech input terminal for transmitting speech data to a speech recognition apparatus through a wire or wireless communication network comprising:

speech input means;

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and

communication means for transmitting the information to said speech recognition apparatus.

2. The terminal according to claim 1, wherein the information is based on at least one of a characteristic of said speech input means, a noise characteristic, and a speaker characteristic.

3. The terminal according to claim 1, further comprising means for, when a data conversion condition for communication based on the information is received from said speech recognition apparatus, converting the speech data on the basis of the conversion condition.

4. The terminal according to claim 1, further comprising:

means for storing the information;

means for determining whether there has been a change in the information in each communication; and

means for, when there has been no change in the information, notifying said speech recognition apparatus of the corresponding information.

5. The terminal according to claim 1, wherein

said terminal further comprises means for creating a speech recognition model on the basis of the information, and

said communication means transmits the information and/or the speech recognition model to said speech recognition apparatus.

6. A speech recognition apparatus comprising:

speech recognition means for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network; and

means for receiving information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof from said speech input terminal, wherein said speech recognition means executes speech recognition processing on the basis of the information.

7. A speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of the transmitted speech data; and

means for executing speech recognition processing on the basis of the information.

8. The apparatus according to claim 6, further comprising means for creating a speech recognition model on the basis of the information.

9. The apparatus according to claim 7, further comprising means for creating a speech recognition model on the basis of the information.

10. A speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

means for receiving information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof from said speech input terminal;

means for determining a data conversion condition for communication on the basis of the information; and

means for transmitting the data conversion condition to said speech input terminal.

11. A speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

means for creating information for speech recognition, which is unique to said speech input terminal or represents

an operation state thereof, on the basis of the transmitted speech data;

means for determining a data conversion condition for communication on the basis of the information; and

means for transmitting the data conversion condition to said speech input terminal.

12. The apparatus according to claim 10, wherein the data conversion condition includes a data conversion condition based on a quantization table created on the basis of the information.

13. The apparatus according to claim 11, wherein the data conversion condition includes a data conversion condition based on a quantization table created on the basis of the information.

14. The apparatus according to claim 6, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the information in correspondence with to each of said speech input terminals.

15. The apparatus according to claim 7, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the information in correspondence with to each of said speech input terminals.

16. The apparatus according to claim 10, further comprising means for, when said speech input terminal

comprises a plurality of speech input terminals, storing the information in correspondence with each of said speech input terminals.

17. The apparatus according to claim 11, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the information in correspondence with each of said speech input terminals.

18. The apparatus according to claim 8, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the speech recognition model in correspondence with each of said speech input terminals.

19. The apparatus according to claim 10, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the data conversion condition in correspondence with each of said speech input terminals.

20. The apparatus according to claim 11, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the data conversion condition in correspondence with each of said speech input terminals.

21. A speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless

communication network wherein

said speech input terminal comprises

speech input means,

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, and

communication means for transmitting the information to said speech recognition apparatus, and

said speech recognition apparatus comprises

means for executing speech recognition processing on the basis of the information.

22. A speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein

said speech recognition apparatus comprises

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of speech data from said speech input terminal, and

means for executing speech recognition processing on the basis of the information.

23. A speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein

said speech input terminal comprises

speech input means,

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, and

communication means for transmitting the information to said speech recognition apparatus, and

said speech recognition apparatus comprises

means for determining a data conversion condition for communication on the basis of the information, and

means for transmitting the data conversion condition to said speech input terminal.

24. A speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein

said speech recognition apparatus comprises

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of speech data from said speech input terminal,

means for determining a data conversion condition for communication on the basis of the information, and

means for transmitting the data conversion condition to said speech input terminal.

25. A speech communication method of transmitting speech

data from a speech input terminal to a speech recognition apparatus through a wire or wireless communication network comprising:

in the speech input terminal,

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and

the step of transmitting the information to the speech recognition apparatus.

26. A speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

the step of receiving information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof from the speech input terminal; and

the step of executing speech recognition processing on the basis of the information.

27. A speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of

data transmitted from the speech input terminal; and

the step of executing speech recognition processing on the basis of the information.

28. A speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

the step of receiving information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof from the speech input terminal;

the step of determining a data conversion condition for communication on the basis of the information; and

the step of transmitting the data conversion condition to the speech input terminal.

29. A speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of data transmitted from the speech input terminal;

the step of determining a data conversion condition for communication on the basis of the information; and

the step of transmitting the data conversion condition

to the speech input terminal.

30. A speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising:

in the speech input terminal,

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and

the step of transmitting the information to the speech recognition apparatus, and

in the speech recognition apparatus,

the step of executing speech recognition processing on the basis of the information.

31. A speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising:

in the speech recognition apparatus,

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal; and

the step of executing speech recognition processing on the basis of the information.

32. A speech communication method between a speech input

terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising:

in the speech input terminal,

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and

the step of transmitting the information to the speech recognition apparatus, and

in the speech recognition apparatus,

the step of determining a data conversion condition for communication on the basis of the information; and

the step of transmitting the data conversion condition to the speech input terminal.

33. A speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising:

in the speech recognition apparatus,

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal;

the step of determining a data conversion condition for communication on the basis of the information; and

the step of transmitting the data conversion condition

to the speech input terminal.

34. A storage medium recording a program for, in order to transmit speech data from a speech input terminal to a speech recognition apparatus through a wire or wireless communication network, causing a computer to function as

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, and

communication means for transmitting the information to said speech recognition apparatus.

35. A storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as

means for receiving information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof from said speech input terminal; and

means for executing speech recognition processing on the basis of the information.

36. A storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as

means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of the speech data transmitted from said speech input terminal, and

means for executing speech recognition processing on the basis of the information.

37. A storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as

means for receiving information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof from said speech input terminal; and

means for determining a data conversion condition for communication on the basis of the information, and

means for transmitting the data conversion condition to said speech input terminal.

38. A storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as

means for creating information for speech recognition, which is unique to said speech input terminal or represents

an operation state thereof, on the basis of the speech data transmitted from said speech input terminal,

means for determining a data conversion condition for communication on the basis of the information, and

means for transmitting the data conversion condition to said speech input terminal.

ABSTRACT OF THE DISCLOSURE

A speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein the speech input terminal comprises speech input unit, a unit for creating environment information for speech recognition, which is unique to the speech input terminal or represents its operation state, and a communication control unit for transmitting the environment information to the speech recognition apparatus, and the speech recognition apparatus executes speech recognition processing on the basis of the environment information.

FIG. 1

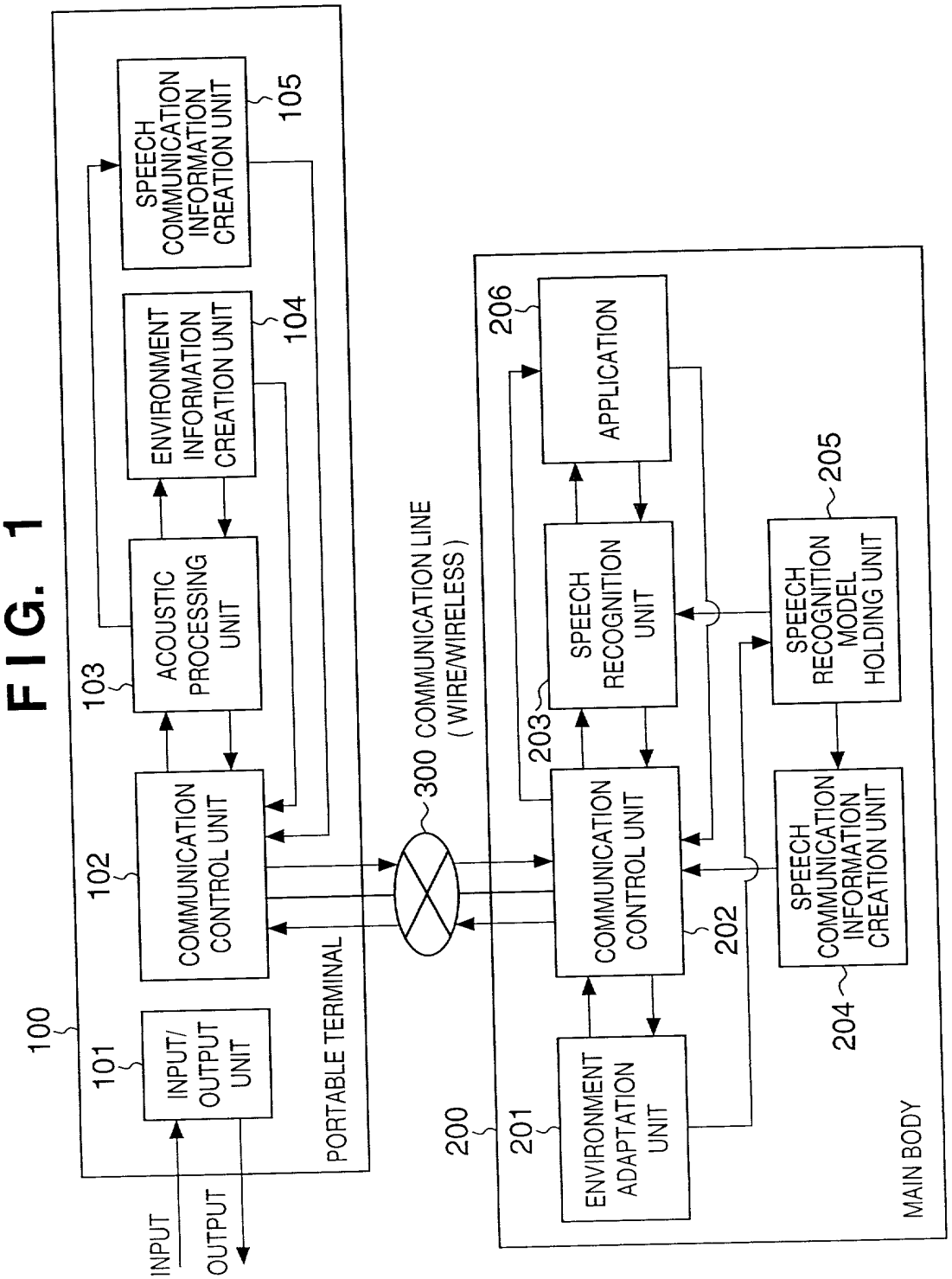
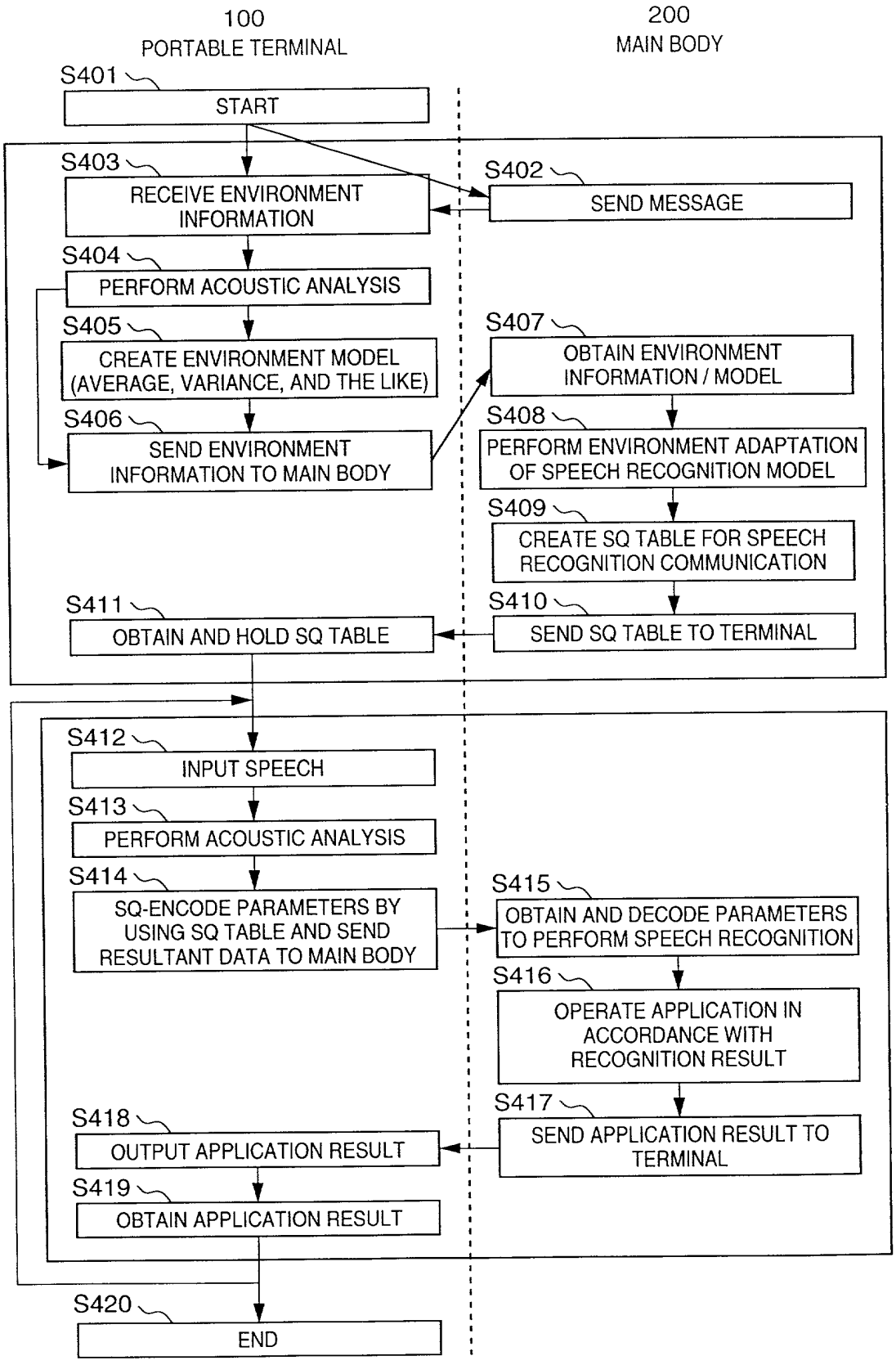

100
PORTABLE TERMINAL
101
INPUT/
OUTPUT
UNIT
INPUT
OUTPUT
102
COMMUNICATION
CONTROL UNIT
103
ACOUSTIC
PROCESSING
UNIT
104
ENVIRONMENT
INFORMATION
CREATION UNIT
105
SPEECH
COMMUNICATION
INFORMATION
CREATION UNIT
300 COMMUNICATION LINE
(WIRE/WIRELESS)
200
MAIN BODY
201
ENVIRONMENT
ADAPTATION
UNIT
202
COMMUNICATION
CONTROL UNIT
203
SPEECH
RECOGNITION
UNIT
204
SPEECH
COMMUNICATION
INFORMATION
CREATION UNIT
205
SPEECH
RECOGNITION
MODEL
HOLDING UNIT
206
APPLICATION

FIG. 2


100
PORTABLE TERMINAL
200
MAIN BODY
S401
START
S403
RECEIVE ENVIRONMENT INFORMATION
S402
SEND MESSAGE
S404
PERFORM ACOUSTIC ANALYSIS
S405
CREATE ENVIRONMENT MODEL (AVERAGE, VARIANCE, AND THE LIKE)
S406
SEND ENVIRONMENT INFORMATION TO MAIN BODY
S407
OBTAIN ENVIRONMENT INFORMATION / MODEL
S408
PERFORM ENVIRONMENT ADAPTATION OF SPEECH RECOGNITION MODEL
S409
CREATE SQ TABLE FOR SPEECH RECOGNITION COMMUNICATION
S410
SEND SQ TABLE TO TERMINAL
S411
OBTAIN AND HOLD SQ TABLE
S412
INPUT SPEECH
S413
PERFORM ACOUSTIC ANALYSIS
S414
SQ-ENCODE PARAMETERS BY USING SQ TABLE AND SEND RESULTANT DATA TO MAIN BODY
S415
OBTAIN AND DECODE PARAMETERS TO PERFORM SPEECH RECOGNITION
S416
OPERATE APPLICATION IN ACCORDANCE WITH RECOGNITION RESULT
S417
SEND APPLICATION RESULT TO TERMINAL
S418
OUTPUT APPLICATION RESULT
S419
OBTAIN APPLICATION RESULT
S420
END

CFM 2001 US
P200-0215 US

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
(Page 1)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

SPEECH INPUT TERMINAL, SPEECH RECOGNITION APPARATUS, SPEECH COMMUNICATION SYSTEM, AND SPEECH COMMUNICATION METHOD

the specification of which [x]is attached hereto. [ ] was filed on_____

as United States Application No. or PCT International Application No. _____
and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b), of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designates at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed:

Country	Application No.	Filed (Day/Mo./Yr.)	(Yes/No) Priority Claimed
JAPAN	11-260760	14/09/1999	Yes

I hereby appoint the practitioners associated with the firm and customer number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to the address associated with that Customer Number:

FITZPATRICK, CELLA, HARPER & SCINTO
Customer Number: 05514

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

CFM 200105
P200-021505

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

(Page 2)

Full Name of Sole or First Inventor Yasuhiro KOMORI
Inventor's signature Yasuhiro Komori
Date September 5, 2000 Citizen/Subject of Japan
Residence 412-9, Chitose, Takatsu-ku, Kawasaki-shi, Kanagawa-ken, Japan
Post Office Address c/o CANON KABUSHIKI KAISHA, 30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo, Japan

Full Name of Second Joint Inventor, if any Masayuki YAMADA
Inventor's signature Masayuki Yamada
Date September 5, 2000 Citizen/Subject of Japan
Residence 30-51-103, Shukugawara 4-chome, Tama-ku, Kawasaki-shi, Kanagawa-ken, Japan
Post Office Address c/o CANON KABUSHIKI KAISHA, 30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo, Japan

F511/A601948/ald